Executive Summary

An enterprise architecture (EA) is a logically consistent set of principles and best practices that guide the engineering of an organization's information systems and technology infrastructure within the enterprise's business architecture. This requires a method to express Information Technology (IT) strategy, policies, standards and technical directions to agencies within the State. Figure One, below, illustrates the framework for the State of Wisconsin's Enterprise Architecture initiative. EA planning is a "garbage in, garbage out" process. The quality of the linkage to business planning processes is integral to the quality of the output of the EA effort.
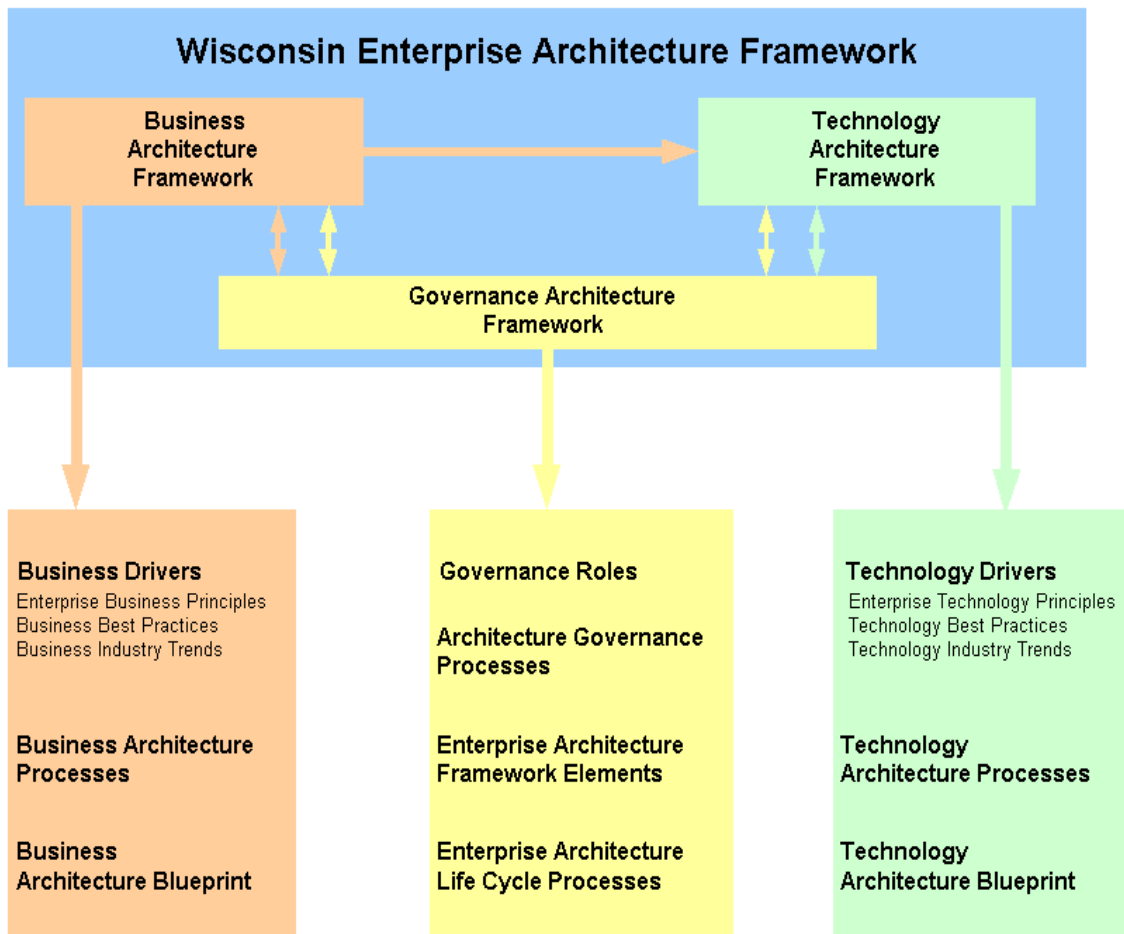

Figure One Wisconsin Enterprise Architecture Framework

The common set of EA principles and directions will provide a framework for sharing services and data, and provides IT value to all State agencies and departments. The purpose of an EA is to guide the development of the information systems infrastructure. The EA establishes consistency by helping:

1. Provide managers and staff in the agencies and support services an understanding of the information systems infrastructure they are using

2. Provide a mechanism so state Information Technology professionals have a consistent view of the information systems infrastructure and the methods should they employ to develop and deliver information systems services

3. Ensure the various development projects being managed in the State do not attempt to make incompatible changes to the infrastructure

Enterprise architectural standards will require an on-going commitment by the state. The evolution of new products, technology trends, business trends and user demands will require a constant update to architectural standards to ensure that data and service remain accessible. Convergence to the enterprise architectural standards will evolve over a long period of time.

Enterprise Architecture

IBM introduced the concept of an IT architecture with the 1964 System/360 announcement. At the time, architecture de-coupled how a machine worked from how it was programmed. Since 1964, the definition of architecture has expanded to encompass similar de-coupling in storage, network, database and human interface design. In order to develop Enterprise Architecture, there must be a common understanding of what architecture is.

The definition of architecture that will be used in this document is taken from the IBM Systems Journal:

> *The architecture of an IT system is the structure or structures of the system, which comprise software and hardware components, the externally visible properties of those components, and the relationships among them[1]*

Large enterprises often apply this architectural approach to develop their own enterprise computing strategies as a liberating mechanism: The goal is to de-couple software, data and training investments from the "vendor we happen to be using for this activity at the moment."

The purpose of the EA is to guide the development of the information systems infrastructure. It establishes consistency by helping to:

1. Provide a mechanism for a constant view of the information system infrastructure to serve as the basis from which the various groups of IT professionals develop and deliver information systems services.

2. Provide business support services managers and staff with an understanding of the information systems infrastructure they are using.

3. Ensure contracted development projects do not make incompatible changes to the infrastructure. Contracted projects should not use twilighted standards and should prefer emerging standards whenever they are cost effective.

In general, an EA should:
➢ Align the use of technology with strategic goals and objectives as identified in the enterprise's business architecture.

➢ Manage the increasing complexity of IT technologies.

➢ Facilitate "Bridging" new and emerging IT to legacy architecture.

---

[1] IBM Systems Journal, Vol. 41, No. 2, 2002

➤ Be complete and consistent and provide guidance to application developers, IT managers, and end-users who need to plan, budget as well as, implement and use information technology.

➤ Provide a means to analyze how processes, tools, technology, and people should interact to produce IT solutions that achieve both individual and combined goals.

➤ Provide opportunities to measure and mitigate risk in IT activities.

Facilitating change enables IT to respond in a timely manner to the needs of the business. It enables the IT organization to be more proactive and anticipate change, rather than simply dealing with it as the need arises. EA, strategy development, and enterprise program management are the key disciplines needed to manage such an environment. Figure two, below, illustrates the coordination and intersection of EA, IT Strategic Planning and Enterprise Program Management activities.

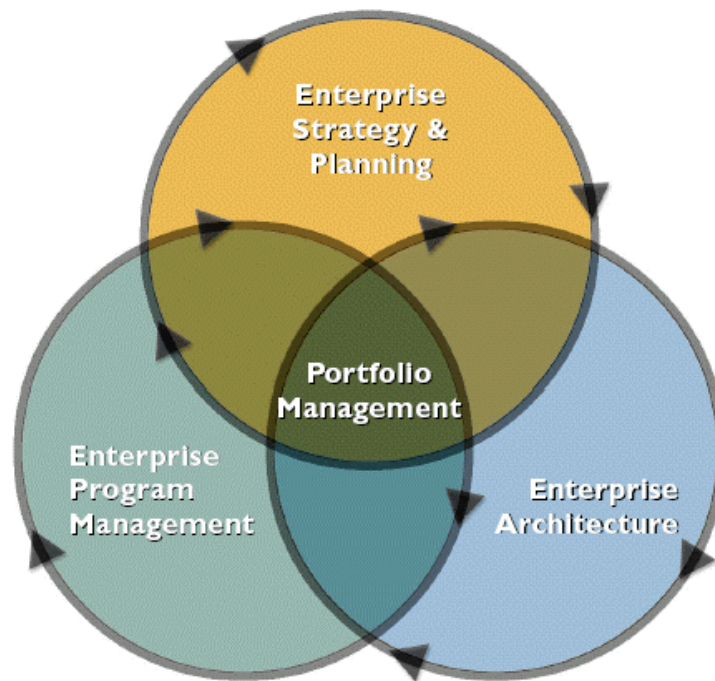Enterprise Planning & Architecture Strategies

Figure Two Enterprise Planning and Architecture Strategies
Source: MetaGroup Enterprise Architecture Desk Reference

Enterprise Architecture Benefits

As we begin development of Wisconsin's first statewide or enterprise level architecture, the goal is not just to deliver an EA that effectively meets present needs. Our goal is to design an ongoing process that will allow us to continually integrate and synchronize appropriate technologies to best serve the business of state government and the citizens of the State. In short, an EA must be highly adaptive, providing continuous alignment between the business of state government and technology.

We have identified the key stakeholders and their architecture-related needs based on the problems and issues within the extended enterprise as documented in table one, below.

Table One Stakeholder Analysis Table

Stakeholder	Need	Solution
Business unit management	Time-to-market improvements	EA application patterns and components
	Understanding of IT´s capabilities	Focused EA documentation
IT executive management	Understanding of IT´s capabilities	Focused EA documentation
	Plan for expanding capabilities	EA plan
	Architecture governance	Effective EA governance processes
Program Area project manager	Examples of proven solutions	EA application patterns and components
	Technical expertise	EA consulting
Individual IT developer	Technical information	EA consulting, EA documentation
Infrastructure management	Stable environment	EA standards, EA governance
Infrastructure support staff	Finite set of supported technology	EA standards, EA governance

An EA is intended to provide the following benefits to an organization:

➢ Better service to citizens through more integrated, higher quality information systems.

➢ Reduced cost through coordinated acquisition and shared development processes.

➢ Better information to decision-makers due to improved access to data.

➢ Increased level of performance through a reduction of complexity as a result of technical standardization.

➢ Facilitation of policy initiatives through more consistent support for inter-agency initiatives.

➢ Reduction of system development time by employing re-usable components.

➢ Reduced total cost of ownership.

➢ Increased understanding of IT direction as a result of easy access to technology priorities.

➢ Simplification of Bid Specification templates, Requests For Information (RFI), Requests For Proposals (RFPs), and Invitations to Bid (IFB) because of the explicit description of required characteristics and features.

➢ Improved consistency of operations by repeating best practices more broadly across agency business missions.

Case studies of comprehensive infrastructure standardization programs from major corporations such as Mobil, British Petroleum and General Motors have documented millions of dollars in annual savings, mostly from reduced support costs.

In addition, some industry studies have attempted to show overall value by correlating overall IT costs with competency scores for architecture and standardization, showing that EA planning and standards compliance reduce total IT budget expenses by about 30 percent.

Application development that follows EA application architecture standards can foster the development of code that is better structured for maintainability and reuse. The specific application architectures used can also simplify maintenance - for example, a browser-based application server architecture eliminates desktop deployment and configuration.

Furthermore, a standardized infrastructure will reduce chaos in the operating environment, bringing greater stability and improved quality. As technological diversity is reduced, the economies of scale take effect and can significantly reduce support costs. Two examples documenting actual quantifiable savings from an EA effort from Forrester Research Analyst Gene Leganza include:

- "Development Savings from Using Architecture Patterns Quatified", the article quantifies savings in training, project design and project implementation from using architecture patterns, one of the key deliverables of an enterprise architecture program.

- "Follow the Money: The Cost of Implementing Nonstandard Technology" provides an example of savings derived from reduced technology selection, testing and implementation time achieved by using standards.

Enterprise Architecture Scope

The EA will serve as a foundation framework on which the State of Wisconsin and its member agencies can build a technological infrastructure to facilitate the responsible and expeditious deployment of the State's information assets. It will provide high-level guidance for aligning business drivers and architectural requirements with the underlying technological components to meet the vision of the EA. It will define a logically consistent set of principles that will guide engineering across the Technology Leadership Council's (TLC) domain architectures. And, it will identify and verify the necessary Domain Architectures.

The creation of the EA Principles facilitates and supports the establishment of a common technology vision across the enterprise and builds consensus and understanding through continuous dialogue between the different domain teams. This moves issues and concerns into an open forum, where decisions are made using the consensus approach. The EA Principles enable the organization to integrate various components of the technology into the overall business vision by providing auditable linkages back to the business change drivers. They help to ensure that not only are business rules enforced, but a principle-based model is used in the governance of deployment.

The Principles provide guidance, in lieu of defined standards, while the EA effort continues to evolve to a comprehensive set of product and configuration standards. These principles should enable faster deployment of new technologies by providing the common framework that will reduce the need to reassess each individual domain. This common framework, i.e. the EA, will ensure that systems are defined logically as well as independent of technology constraints.

These principles also establish a common direction and consistent use of technical terms and components. This common language and common inventory will enhance communications and streamline business understanding. As a result, the State's IT environment complexity will be reduced as redundant standards and components are eliminated.

EA Focus – Technology Evaluation Scorecards

IT portfolio management is a disciplined and structured approach of continuous, repeatable, and easily sustainable processes designed to map business requirements to technology decisions. Using a financial metaphor as the foundation, IT portfolio management enables organizations to categorize, evaluate, prioritize, purchase, and manage technology assets (hardware, software, people) and projects. It also enables organizations to align IT spending (related to these assets and projects) with current and future business needs to achieve an acceptable balance of risk and reward.

An IT portfolio planning and management approach forces organizations to think through the enterprise implications of their IT

spending. META Group research consistently finds that, when organizations initially institute a portfolio approach, IT expenditures decline by 15%-20%, with no significant negative impact.

Establishing an EA will allow the State of Wisconsin to drive the process of continuously aligning business strategies with IT direction. Future state is identified via EA principles that guide the selection, creation, and implementation of technology solutions that meet the needs of the State of Wisconsin.

The EA principles are intentionally designed to be as product/vendor agnostic as possible to maximize current investments in technology, provide a workable transition path to targeted technologies, maintain flexibility, enhance interoperability and sharing, and to promote fair competition.

The Wisconsin Enterprise Architecture Team (WEAT) will establish a formal process to select, score, evaluate and determine EA target technologies. Selection of EA target technologies will be based upon EA principles using a balanced scorecard methodology to rank or weight competing target technologies. Appendix A provides a target technology scorecard example for operating platform selection from the State of Arizona's Government Information Technology Agency, Office of Enterprise Architecture.

Appendix A
Sample Target Technology Scorecard for Operating Platform Selection from the State of Arizona Government Information Technology Agency, Office of Enterprise Architecture

Score. Questions for the four (4) platform device categories are scored with one (1) point for a "Yes" answer, and zero (0) for a "No" answer. Maximum possible is the total number of questions for each category.

Applicable is defined as pertinent, related to, relevant, and appropriate.

Capability is the potential and ability for development or use. It is the capacity to be used or developed for a purpose.

Device includes logical groupings or categories of server, storage, and client platforms in use statewide, or within an agency.

Maximize is defined as taking full advantage of the subject attribute(s).

Variety is defined simply as more than one. Note: the intent of versatility is to maximize flexibility and usefulness of a device relative to the applicable agency business applications.

Widespread is defined as extensive and prevalent.

Table Two - Overall Platform Scorecard

Category	Max. Possible	Score	Category Description
1. Versatility	8		Provides flexibility, adaptability, and scalability without requiring substantial modification.
2. Operating Systems	6		Utilizes open- or pervasive-industry-standard, secure, operating systems.
3. Operating Systems Security	7		Addresses the security functionality of Operating Systems.
4. Open Standard Interfaces & Drivers	4		Adheres to open-system-standard interface specifications and utilizes device drivers with IEEE interfacing and industry de facto standard protocols and formats.
Total Rating Points	25		

Versatility refers to a device's capability (assuming connectivity where applicable) to provide interoperability, flexibility, adaptability, and scalability without requiring substantial modification. Table three, below, illustrates the versatility scorecard for the selection of an operating platform.

Table Three – Versatility for Operating Platform Scorecard

Score 1 Rating Point for a "Yes" answer	Yes
1. Is the device capable of delivering applicable EA Target standards without major upgrades and additional costs?	
2. Is the device capable of delivering or providing secure (as defined by the *State of Arizona Target Security Architecture*) end-user interface access to a variety of business applications (HRIS, email, office productivity applications, Internet, telephony, voice mail, etc.) without substantial modifications, regardless of end-user location?	
3. Is the device capable of delivering or providing end-user interface access to a variety of business applications maximizing a fully converged network, regardless of end-user location?	
4a. Server only – is the device capable of hosting or delivering multiple, and varied application solutions, with sufficient reliability, redundancy, and fault tolerance to support essential agency business operations?	
4b. Storage only – is the device capable of hosting or delivering storage for multiple, and varied application solutions, with sufficient reliability, redundancy, and fault tolerance to support essential agency business operations?	
4c. Client only – is the device capable of providing one common point for end-user connectivity access and productivity for multiple and varied application solutions?	
5. Is the device able to maximize the use of the EA Target Network Architecture standards?	
6. Is the device capable of accommodating increased demands for service and new application solutions without substantial modifications?	
7. Are widespread choices for off-the-shelf application solutions, without modifications, available for this device?	
8. Does the versatility of this device directly improve the quality and timeliness of agency business functions?	
Total Rating Points	

Operating Systems refers to a device's, or networks, capability to utilize open- or pervasive-industry-standard operating systems. Table four, below, illustrates the operating systems scorecard for the selection of an operating platform.

Table Four – Operating Systems for Operating Platform Scorecard

Score 1 Rating Point for a "Yes" answer	Yes
1. Is an open-industry-standard operating system currently available for this device?	
2. Is the operating system currently deployed with this device an open or industry de facto standard operating system?	
3. Does the operating system currently deployed with this device allow for all updates to be pushed to, or accepted by, all associated devices?	
4. Is the same version of the operating system currently deployed with this device available for all similar devices offered by the manufacturer?	
5. Is the installed version of the operating system currently deployed with this device the most current production version, or no more than one major revision behind the most current available?	
6. Is the operating system currently deployed with this device scheduled for future production releases?	
Total Rating Points	

Operating Systems Security refers to a security functionality that is available with the Operating System (must be answered relative to responses in 2. Operating Systems.) Table five, below, illustrates the operating systems security scorecard for the selection of an operating platform.

Table Five – Operating Systems Security for Operating Platform Scorecard

Score 1 Rating Point for a "Yes" answer	Yes
1. Do the operating system security services align with the AZ EA Target Security Architecture?	
2. Does the operating system security allow for logging and the security controls for applications, platform, and network levels to be integrated to reduce and eliminate redundancies?	
3. Does the operating system support access, authentication, and authorization techniques as defined in the *State of Arizona Target Security Architecture* and related standards?	
4. Does the operating system allow for an integrated LDAP directory service?	
5. Does the operating system allow for all security updates to be pushed to, or accepted by, all associated devices?	
6. Does the operating system allow for logging and the restriction, including preventing end-user override, of particular functions or services, such as non-essential or redundant services, communication options that are susceptible or prone to abuse, and operating-system-level utilities?	

7. Can extraneous services, open ports, etc., be easily removed from "default installations of the operating system" and prevented from returning when the operating system is upgraded?	
Total Rating Points	

Open Standard Interfaces and Drivers refer to a device's capability to adhere to open-system-standard interface specifications and to utilize device drivers that use IEEE and industry de facto standard protocols and formats. Table six, below, illustrates the open standard interfaces and drivers scorecard for the selection of an operating platform.

Table Six – Open Standard Interfaces and Drivers for Operating Platform Scorecard

Score 1 Rating Point for a "Yes" answer	Yes
1. Does the device utilize target network standards for communication protocols?	
2. Is the device capable of being configured, managed, and maintained using standard SNMP-based management tools?	
3. Is the device capable of utilizing open-standard drivers that employ IEEE-interfaces and industry de facto standard software drivers?	
4. Are multiple, off-the-shelf, peripheral devices that conform to open-system-standards and that utilize industry de facto standard drivers available for this device?	